

**Ecological Havoc, the Rise of White-Tailed Deer,  
and the Emergence of *Amblyomma americanum*-Associated  
Zoonoses in the United States**

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**Abstract** Two infectious diseases, and one presumably infectious disease, each vectored by or associated with the bite of the lone star tick (*Amblyomma americanum*), were identified and characterized by clinicians and scientists in the United States during the 1980s and 1990s. These three conditions—human monocytic (or monocytoprotropic) ehrlichiosis (HME), *Ehrlichia ewingii* ehrlichiosis, and southern tick-associated rash illness (STARI)—undoubtedly existed in the United States prior to this time. However,

the near-simultaneous recognition of these diseases is remarkable and suggests the involvement of a unifying process that thrust multiple pathogens into the sphere of human recognition. Previous works by other investigators have emphasized the pivotal role of white-tailed deer (*Odocoileus virginianus*) in the emergence of Lyme disease, human babesiosis, and human granulocytic anaplasmosis. Because whitetails serve as a keystone host for all stages of lone star ticks, and an important reservoir host for *Ehrlichia chaffeensis*, *E. ewingii*, and *Borrelia lonestari*, the near-exponential growth of white-tailed deer populations that occurred in the eastern United States during the twentieth century is likely to have dramatically affected the frequency and distribution of *A. americanum*-associated zoonoses. This chapter describes the natural histories of the pathogens definitively or putatively associated with HME, *E. ewingii* ehrlichiosis, and STARI; the role of white-tailed deer as hosts to lone star ticks and the agents of these diseases; and the cascade of ecologic disturbances to the landscape of the United States that have occurred during the last 200 years that provided critical leverage in the proliferation of white-tailed deer, and ultimately resulted in the emergence of these diseases in human populations.

## 1 Introduction

The American white-tailed deer (*Odocoileus virginianus*) is the oldest deer species alive. It is an expert in surviving predation of diverse forms and, like other old North American indigenous mammals, adjusts remarkably well to human activity, to cities, and to agriculture. It is a deer of ecological havoc, a survival virtuoso. . .

Valerius Geist 1998

Five tickborne infectious diseases—babesiosis, Lyme disease, human monocytic (or monocyctotropic) ehrlichiosis (HME), human granulocytic anaplasmosis (HGA), and *Ehrlichia ewingii* ehrlichiosis—were identified and characterized by clinicians and scientists in the United States during a relatively short span of three decades between 1969 and 1999 (Scrimanti 1970; Western et al. 1970; Steere et al. 1978; Maeda et al. 1987; Bakken et al. 1994; Buller et al. 1999). A sixth, as-yet etiologically uncharacterized syndrome, southern tick-associated rash illness (STARI), was also discovered during this period (Schulze et al. 1984; Masters et al. 1994, 1998). The appreciation of these previously unrecognized infections and subsequent discoveries of the varied pathogenic agents that caused these conditions effectively doubled the number of distinct, North American, tick-transmitted diseases and expanded considerably the recognized magnitude of tick-borne infections in the United States. Until the early 1980s, Rocky Mountain spotted fever was the most commonly recognized tick-borne disease in the United States. During 2003, passive surveillance identified approximately 1,100 cases of this disease; however, approximately 320, 360, and